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ABSTRACT

The Accelerated Math and Science (AMS) Project is a 3 year program funded by the California Migrant Education Program Improvement Program. It targets 6th, 7th, and 8th grade low-achieving migrant students who are 2 to 4 years behind their language peer group. Two questions guided the second year evaluation study for the Region IX Migrant Education program: (1) How successful was the training provided to migrant students in science and math?, and (2) Did the attitude of participating migrant students change towards science and math? Middle schools, low achieving, migrant students (n=94) were recruited based upon: (1) inappropriate age/grade placement; (2) those students whose parents expressed a high degree of interest and commitment, to ensure student attendance in AMS; (3) students who had absentee rates of 10% or more annually; and (4) students who had a minimum 3rd-grade Spanish reading level. AMS program activities consisted of a 19 day curriculum consisting of 80 to 95 hours of direct instruction. Participating teachers were selected based on their credentials or subject matter authorizations and commitment to the AMS program. Pre- and post-data in four skill areas indicated student growth in all four areas: attitudes towards math and science, metric system skills, observational skills, and scientific method skills. In addition, review of daily work in student journals suggested that students improved in their ability to describe their work. Nine appendices contain supporting data including a participant profile, graphic profiles of results (pre and post test scores, photographs, and a student mathematics survey. (MKR)

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ED 386 374

Accelerated Math and Science Program Inprovement Project Evaluation Report YR 2

Region IX Migrant Education
California State Department of Education

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by
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Social Equity Technical Assistance Center
Policy Studies Department
San Diego State University

September 30, 1994

SE 056 359

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1993-94 PIP Annual Evaluation Report

California State Department of Education

Region: IX

Districts

ANAHEIM HSD	Vallecitos
BONSALL	VALLEY CENTER
PAUMA	VISTA UNIFIED

Submission Type

Check one

Continuing PIP Application ☐

Annual Report Only ☒

Contact Person

Name: CELIA RAMIREZ

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Total funded for 1993-94: $48,093

Total migrant students: 104

Cost per student: $512 (based N=94)

Total amount requested for 1994-95:

Project title: ACCELERATED MATH & SCIENCE

Type: Program ☒ Practice/Procedure ☐ Materials ☐

First year funded: 1992-93

Years completed: 1st ☐ 2nd ☒ 3rd ☐ Other ☐

Purpose of Project:

The Accelerated Math and Science (AMS) program is designed to extend instructional hours with intersession and summer program. In addition, it will accelerate learning rates for 6-7-8 grade migrant students, who are behind their peers 2 to 4 years and the opportunity to: academically increase their achievement in Math and Science, increase their enrollment in college preparatory Math and Science courses, reduce student absenteeism, reduce dropout rates. The AMS program offers teachers the opportunity to: provide teachers with the expertise to adopt/adapt the program at their school sites, and provide a model to be replicated.

Signatures

Project Director:

Regional Director:

Parent Representation:

Evaluator

Name: DR. ALBERTO M. OCHOA

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Form 1

Executive Summary - Abstract for PIP

California State Department of Education

First Year ☐
Second Year ☒
Third Year ☐

Project Title: ACCELERATED MATH & SCIENCE

Needs Statement for Program:

AMS targets students who are four years behind their language peer group. Middle school students are selected based on achievement data from the school district records and 1992-93 Region IX Student and Program Needs Assessment (SAPNA) summary pages. Participating teachers are selected based on their credential or subject matter authorizations and commitment to the AMS program.

Program Goals and Description of Major Project Activities:

For every year of program participation, students will demonstrate increased academic achievement levels in Math and Science and lower absentee and dropout rates over the control group. At the end of three years, 70% of the first year student participants will be enrolled in college preparatory Math and Science courses also at significantly higher rate than the control group.

Description of Participants Served:

The selection of AMS student participants is based upon the capacity to have success. Student participants are recruited based upon: (1) Inappropriate age/grade placement; (2) Those students whose parents express a high degree of interest, and commitment to ensure student attendance in AMS; (3) Students who have absentee rates of 10% or more annually, and (4) Students who are literate --minimum 3rd grade Spanish reading level.

Process/Implementation Evaluation Results:

Ninety-four students have participated in the Accelerated Math and Science summer program involving 6 school districts. A project coordinator has facilitated the planning, design and implementation of training activities. In year two, a 19 day (95 hours) program was implemented. Teacher and assistants had four meetings that involved curriculum planning that was guided by project consultants. Pre and post data in four skill areas was collected and analyzed. Positive and significant results were attained.

Evaluation Results Demonstrating Participant Improvements:

The evaluation results are very positive and indicate student growth in the four evaluated areas: attitude towards math and science, metric system skills, observational skills and scientific method skills. Using Pairs T-test statistical analysis for all four skill areas significant gains were attained at the .05 level of significance (with .01 in three areas). In addition, review of student journals of their daily work suggest that students improved in their ability to describe their work from day 1 to 19.

Recommendations:

To continue to improve and maintain the focus of the project, specifically in addressing students who are underachieving. There is also the need to improve the documentation of the program across all participating districts with respect to student profiles and achievement data. Participating students also need to be monitored or be visited at home by the summer teachers during the school year in order to achieve the long term goal of having 70% of the students enrolled in college preparatory courses. While the summer program is successful, involvement with the students and their parents during the school year is essential to achieve the project goals.

Accelerated Math Science Project
Evaluation Report Prepared

PIP Evaluation Report YR 2

Prepared
by
Alberto M. Ochoa, SDSU

1. Executive Summary

The second year evaluation assessed the impact of the training provided by Accelerated Math Science Project teachers during the summer of 1994 to selected migrant students. The Accelerated Math Science Project (AMS) is a three year program funded by the California Migrant Education Program Improvement Program. Two questions guided the second year evaluation study for the Region IX Migrant Education program: How successful was the training provided to migrant students in science and math?, and Did the attitude of participating migrant students change towards science and math?

AMS program activities consisted of a 19 day curriculum consisting of 80 to 95 hours of direct instruction. Three skill areas were assessed on a pre and post basis, in addition to attendance and attitude towards science and math. The findings indicate significant growth in each of the three skill areas--metric system (math), observational skills (science), and scientific method (science), and a positive shift in attitude towards science and math, and average to high attendance.

2a. Description of Project and Needs Assessment

Description of Project. The Accelerated Math and Science (AMS) program is designed to accelerate the learning rates of 6, 7, and 8th grade low achieving migrant students. The AMS program will increase academic achievement in math and science, reduce absentee and dropout rates, increase enrollment in math and science college preparatory courses, and provide teachers with the expertise to replicate the program model at their school sites.

AMS targets students who are two to four years behind their language peer group. Middle school students are selected based on school district achievement

data and based on the 1991-92 Region IX Student and Program Needs Assessment (SAPNA) data. Participating teachers are selected based on their credential or subject matter authorizations and commitment to the AMS program.

For every year of program participation, it is expected that students will demonstrate increased academic achievement levels in math and science, have lower school absences and dropout rates in comparison to a control group. At the end of three years, it is expected that 70% of the first year student participants will be enrolled in college preparatory math and science courses. In addition, following ninety-five hours of continuous sequential participation, migrant students' GPA's in math and science will be an average of 2.00, as measured by students' academic progress reports.

The Accelerated Math and Science (AMS) Program is designed to accelerate the learning rates of 6,7, and 8th grade low achieving migrant students and provide them with closely supervised learning opportunities in science and math. The AMS is an adapted model that incorporates the key elements of Henry Levin's program, which are: (1) extending the learning time through intersessions and summer programs; (2) using a language based approach for purposes of content mastery by students; (3) providing a rich and rigorous instructional component that encourages students to (4) analyze, synthesize, generalize, and (5) solve problems; (6) providing students with experiential learning activities that give them a personal connection to academic concepts; (7) providing small group instruction to maximize student learning time and thereby academic achievement; and (8) ensuring that those students identified are at a skill level adequate to the demands of the AMS program. Furthermore, Levin's model is based on the premise that low achieving students must learn at a faster rate than other students. The accelerated instructional approach as defined by Levin is: (1) time devoted to learning; (2) quality of resources, such as language based curriculum; (3) a rich and rigorous thinking curriculum; effort, which includes (4) small group instruction, (5) cooperative learning, (6) peer tutoring and (7) active learning experiences; capacity which refers to students who are capable but lack the skills to excel and who are hampered by lack of adequate care such as nutrition.

Needs Assessment. The need for programs such as Accelerated Math and Science is based on the present underachievement of linguistically diverse and low income youth in the areas of math and science. Two necessary skill areas to have access to college and jobs in the informational world of work. Both in absolute number and in proportion the linguistically and ethnically diverse communities will continue to increase in our nation. More than a hundred nations sent immigrants to the United States. In the school context, in 1976, it was estimated that there were 2,520,000 limited English speaking immigrant students in the United States. Projections for the year 2000 point to an increase to 3,400,000--a

growth rate of 15% per decade. Furthermore, In the California economy, it is predicted that more than 80% of the labor force growth in the next decade will be Latinos and Asians who will need to be prepared for the future workforce (U.S. Census Bureau, 1991).

Presently, over 40% of our Latino/Chicano and low income youth dropout of school, while another 30% receive a high school diploma with academic deficiencies that make them under skilled and under employed. Of the remaining 30%, only 15% enter college, and about 2% eventually receive a B.A. Degree (Haycock and Navarro, 1988; Kitchen, 1990; Espinosa & Ochoa, 1992).

Six (6) school districts from Region IX have participated in the Accelerated Math and Science Program, involving one hundred and four(104) migrant 6th to 8th grade students in year two. See **Appendix I** for overview of participating districts. The participating school districts are:

Anaheim High School District
Bonsall School District
Pauma School District
Vallecitos School District
Valley Center School District
Vista School District

b. Description of Project Participants

Ninety-four migrant students participated in the Region IX Migrant Education AMS Program. Student are selected on the basis of: 2 to 4 years behind their peers, having absentee rates of 10% or more annually, students having at least a minimum of 3rd grade Spanish reading level, and parent interest and commitment to ensure student attendance in AMS.

Furthermore, over 89% of the students had a GPA of C+ or less, with 11% having a B- or better GPA. Seventy-six percent (76%) of the students were limited English proficient and 24% English proficient. Fifty-one (51%) percent were male and 49% female.

With respect to staff, six (6) credentialed **teachers and six (6) teacher assistants** were involved in **YR 2** of the AMS. In addition, 11 support staff provided volunteer services in assisting in AMS program activities. Two consultants were used to provide four staff training activities on AMS program design, curriculum and assessment. It is expected that following the 24 hours of staff development, program teachers will be able to assess students' academic levels before and after the instructional component, as well as, fully implement the accelerated instructional component. Following 3 years, teachers trained and experienced in the Accelerated Math and Science Program will be able to

replicate the program at their school sites. Such replication ability will be based upon surveys and interviews of participating teachers.

2c. Analysis of Program Implementation

The evaluator was hired in May of 1994 to undertake the second year evaluation of the program. First year data was found to be limited in scope, in cases, and in the documentation of the 40 students involved in the first year of the program. The following procedures were undertaken in the second year evaluation of the AMS.

Initially, meetings were held with the Region IX Migrant Director and Program Coordinator to gather documents and understand the conceptual design and framework of the program. Information was requested from staff to examine the design of the project and identify the appropriate data required by the Migrant Education Office, California State Department. Also a request was made to down load student achievement data from State data files to determine what data was available for analysis. As necessary the evaluator assisted staff in the development of instruments for data collection to determine the impact of the program. By June 15, 1994 determination was made as to the necessary data to document and assess the impact of the second year of the program.. Instruments were developed and participant data collected by each participating school district.

1. **Instructional Component.** The AMS used a number of teaching approaches. These approaches range from modeling experiments, small group instruction, cooperative learning activities, peer tutoring and active learning experiences. See **Appendix VII** for a sample of a teacher's lesson plans. A review of the teachers lesson plans indicates that the AMS instruction followed similar teaching approaches covering comparable learning activities. Teachers were provided with a number of science and math activities in the form of experiments. Specifically, the following experiments were conducted in the summer of 1994 AMS Program: owl pellets, airplane, oxygen, parachute, acquarian, air bubble, volcano, penny weight, boat, bridge & weights. Journals were kept by each student to write their expressions of the day's activities, what they learned and/or record data. For photographs of students at work, see **Appendix VIII.**

2. **Curriculum Materials.** The materials used consisted of science materials to do a number of science experiments that involved the application reading, writing, computing, working skills, as well as the ability to work with others. An assessment strategies manuscript developed by Ms. Luz Ojeda and Ms. Paula

Wilson was provided to the teachers to use in the implementation of the science and math curriculum activities.

3. **Staff Training.** Four staff training workshop were held on June 11 and 18 and in July 9, 16, 1994. The focus of the training was on AMS program design , curriculum strategies and activities, and assessment. See **Form 9** form results of participant evaluations of sessions. Overall the mean for all four training was 4.39 in a scale of 1.0 (low) to 5.0 (high).

4. **Parent Participation.** Parents were integrated in the AMS program through teacher visits to the students homes. The purpose of these visits was to inform parents of their child's work and to provide information on how parents could assist their children's educational development. No logs were kept by the teachers.

5. **Project Activities.** AMS program activities consisted of a 19 day curriculum consisting of 80 (one district) to 95 hours (5 districts) of direct instruction. Three skill areas were assessed on a pre and post basis, in addition to attendance and attitude towards science and math. The findings indicate significant growth in each of the three skill areas--metric system (math), observational skills (science), and scientific method (science), and a positive shift in attitude towards science and math, and average to high attendance.

3. Presentation of Participant Performance

Procedures. The evaluator met with the program specialists to further identify the salient features of the program. Three assessment instruments were used to assess student 104 pre and post skills and attitudes. The data was analyzed using the SPSS/X statistical package (descriptive and inferential statistics) and content analysis techniques were used for the open ended questions and student journals.

Instruments. Four approaches were used. The first consisted of a series of 15 questions on the metric system--asking to convert equivalent quantities from the English system to metric system. The second consisted of two open ended questions that asked for a detail description of a specimen, as well as a description of the steps of how to conduct an experiment using the scientific method. The third consisted of a Rutgers University Student Mathematics Survey. The fourth approach consisted in the review of student journals and student portfolios using content analysis techniques.(See **Appendix IX** for criteria used).

Limitations of evaluation. The evaluation is limited to six school districts in Region IX of Migrant Education in California. The quality of data collected

differs from district to district. Student achievement records were found to be incomplete, with limited data on student achievement over any one year period. Thus, no control group was used. The evaluation is based on data collected for the period of June 20, 1994 to July 26, 1994. The study collected data during this period cannot account for any intervening conditions that could have influenced student responses.

a. Participant Gain Scores/Baseline Data

The findings of the **students** pre and post test indicate that the AMS was successful in developing student skills in three areas--metric system (math), observational skills (science), and scientific method (science), that students had a positive shift in attitude towards science and math, and that student participation was at the average to high levels of attendance.

Finding #1: A participant profile (**Appendix I**) indicates that 104 students were involved in the AMS program, in six school districts. Furthermore, 41 students were 6th graders, 43 were 7th graders, and 20 were 8th graders.

The review of **attendance records** indicate that **5.3%** of the students (N=104) had low attendance (absent more than 12 days), **36.2%** had average attendance (absent between 6 to 11 days) and 58.5% had high attendance (absent no more than 3 days. (see **Appendix I**).

Finding #2: The results using **T-Test for Paired Samples** of pre and post test data, in the three skill areas and attitude perception towards math and science, indicate that in the three skill areas that there was significant differences between the means at the $p < .01$ level of significance. Growth was positive in metric system skills (math), observational skills (science), and scientific method (science),. In addition, a positive shift and statistical significance at the $p < .05$ level of significance was found for student attitude towards science and math. (see **Appendix II to to VI** for a graphic profile of these results).

Finding #3: The **metric system skills** (N=66) findings indicate that in the pre test 77.2% of the students scored at the poor level (less than 5 correct answers), while at the post test 50% scored at the good to excellent level (11 or more correct answers). See **Appendix III.**

Finding #4: The **observational skills** (N=61) findings indicate that in the pre test 87.1% of the students scored below the criteria of attempting to describe with a logical but flawed strategy. At the post test, 52.3% of the students provided a correct to exemplary reasoning in their description. See **Appendix IV.**

Finding #5: With respect to the skills in **understanding the scientific method (N=59)** the findings indicate that in the pre test 64.4% of the students scored below the criteria of attempting to describe with a logical but flawed strategy. At the post test, 72.0% of the students provided a correct to exemplary reasoning in their description and understanding of the scientific method. See **Appendix V.**

Finding #6: In the **attitude towards math and science (N=74)** domain the findings indicate that in the pre test 59.5% of the students scored below the criteria of low towards math and science (less than 3 positive statements). At the post test, 47.3% of the students scored at the fair level (4 to 7 positive statements) and 5.4% at the high attitude towards math and science (8 to 11 positive statements). See **Appendix VI.**

Finding #7: Using open ended question of **What careers are you considering?** In terms of most mentioned (high) to the least (low) mentioned choices, the responses range as follows:

HIGH:	**artist, policeperson, secretary**
MEDIUM:	**teacher, doctor, engineer**
LOW:	**mechanic, paramedic, mathematician, and locksmith architect, computer technician**

3b. Differentiated Effects

The pre and post test results in the four areas in which data was collected using the T-test statistical test, the findings indicate positive and statistically significant gains. Growth was positive in metric system skills (math), observational skills (science), and scientific method (science) at the $p < .01$ level of significance. A positive shift and statistical significance at the $p < .05$ level of significance was found for student attitude towards science and math. (see **Appendix II**). No comparison group was used.

4. Findings, Conclusions, and Recommendations

The findings indicate that the **Accelerated Math and Science has had a positive impact** on student skill attainment in science and math as measured by three skills areas--observational skills, metric system skills, scientific method skills; attitude towards math and science, and program attendance. Interviews with **participating AMS teachers** (N=6) at the beginning and ending of AMS program indicate a very positive experience for teachers in terms of (1) attitude in working with migrant students, (2) change in perception with respect to student capability, (3) interest in using diverse teaching approaches, (4) positive

interactions with parents during home visits, and (5) a better understanding and use of assessment techniques to assess student work.

With respect to **student** perceptions (N=46) of the **AMS program** based on journal entry comments throughout the program the findings suggest that they enjoyed and had fun doing experiments, having interactive activities as a learning approach, perceiving math and science as a less threatening subject matter, and experiencing good personal interactions with their teachers.

Recommendations

School and Teacher Recommendations

1. The AMS program needs continuity during the school year in order to have the carryover effects of the summer program. Teachers in the summer program should make home visits and monitor student academic work and continue to inform parents how they can assist their child during the school year. Logs should be kept by teachers.

2. AMS needs to be articulated with the school curricula. The targeted school sites need to incorporate and use the skills of the AMS teachers in order to replicate the program at the selected school sites during the school year.

3. Staff training on the long term focus of the program and strategies for institutionalizing the program are highly recommended. The training should focus on the conceptual framework of the program, its enabling activities, and documentation of student growth.

4. The AMS teachers should continue to receive training in the use of creative teaching approaches that integrate math and science. The purpose of the training is to increase the level of teacher skills and assist in the replication of the AMS program at selected school sites.

State and County Migrant Education Offices

8. The statewide Migrant Education Data System has valuable demographic data about the migrant student, but lacks data on student school achievement. Better record keeping of student achievement and support data (language proficiency, learning needs, etc.) needs to be examined and corrected.

9. The program staff, as a whole, needs to improve in the documentation and record keeping of AMS activities. Student records or documentation about their participation, achievement trends, type of core courses taken, and guidance in

preparing for a career and/or college needs to be developed for assessing the long term impact of the program.

References

Espinosa, R. and Ochoa, A. M. (1992). Educational Attainment of California Youth: A Public Equity Crisis. San Diego, CA: Policy Studies Department, College of Education, San Diego State University.

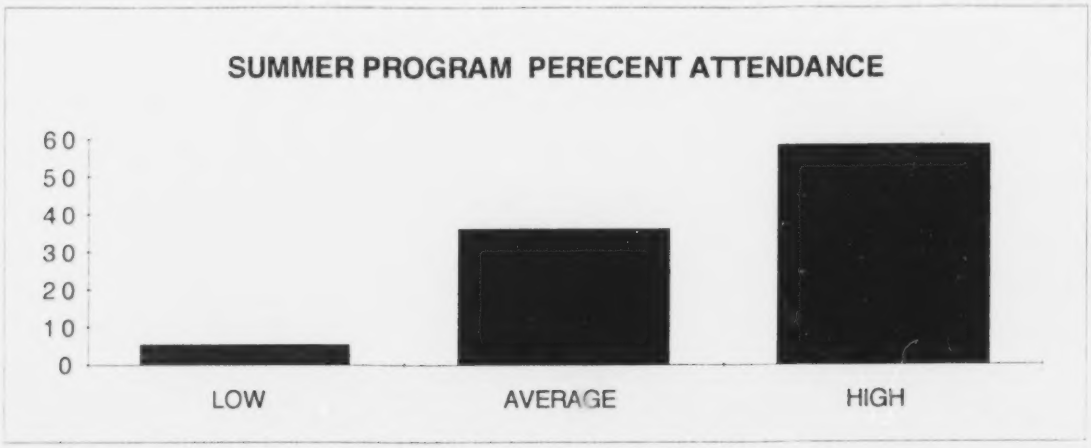
Haycock, K. and Navarro S. (1988). Unfinished Business. A Report from the Planning Committee for the Achievement Council. Oakland, California.

Kitchen, D. (1990). Educational Tracking. Unpublished Doctoral Dissertation SDSU/CGS, Spring.

U.S. Bureau of the Census (1991). *Current population reports*. Series P-20, No. 455. Washington D.C.: U.S. Government Printing Office.

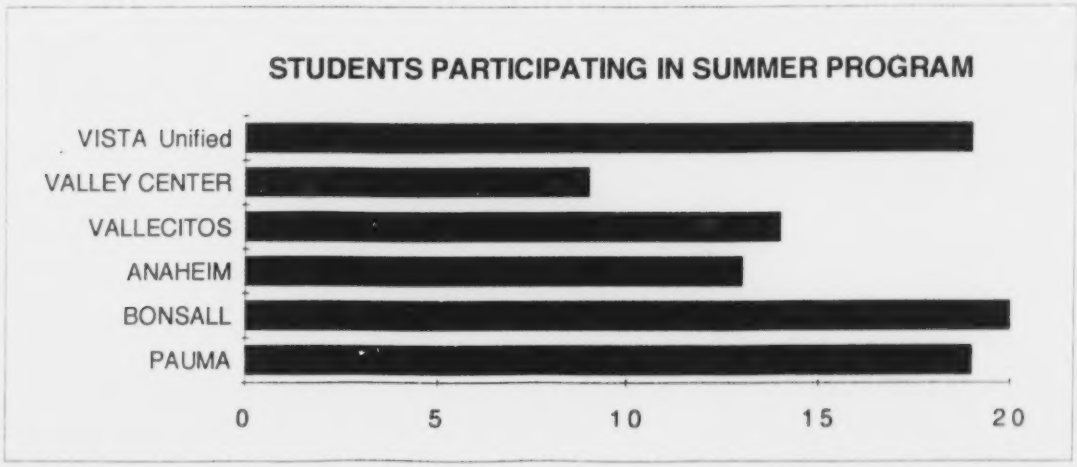
ACCELARATED MATH AND SCIENCE SUMMER PROGRAM

ATTENDANCE	PERCENT	#
LOW	5.3	5
AVERAGE	36.2	34
HIGH	58.5	55
Valid Cases N=94	100	94



PARTICIPANTS

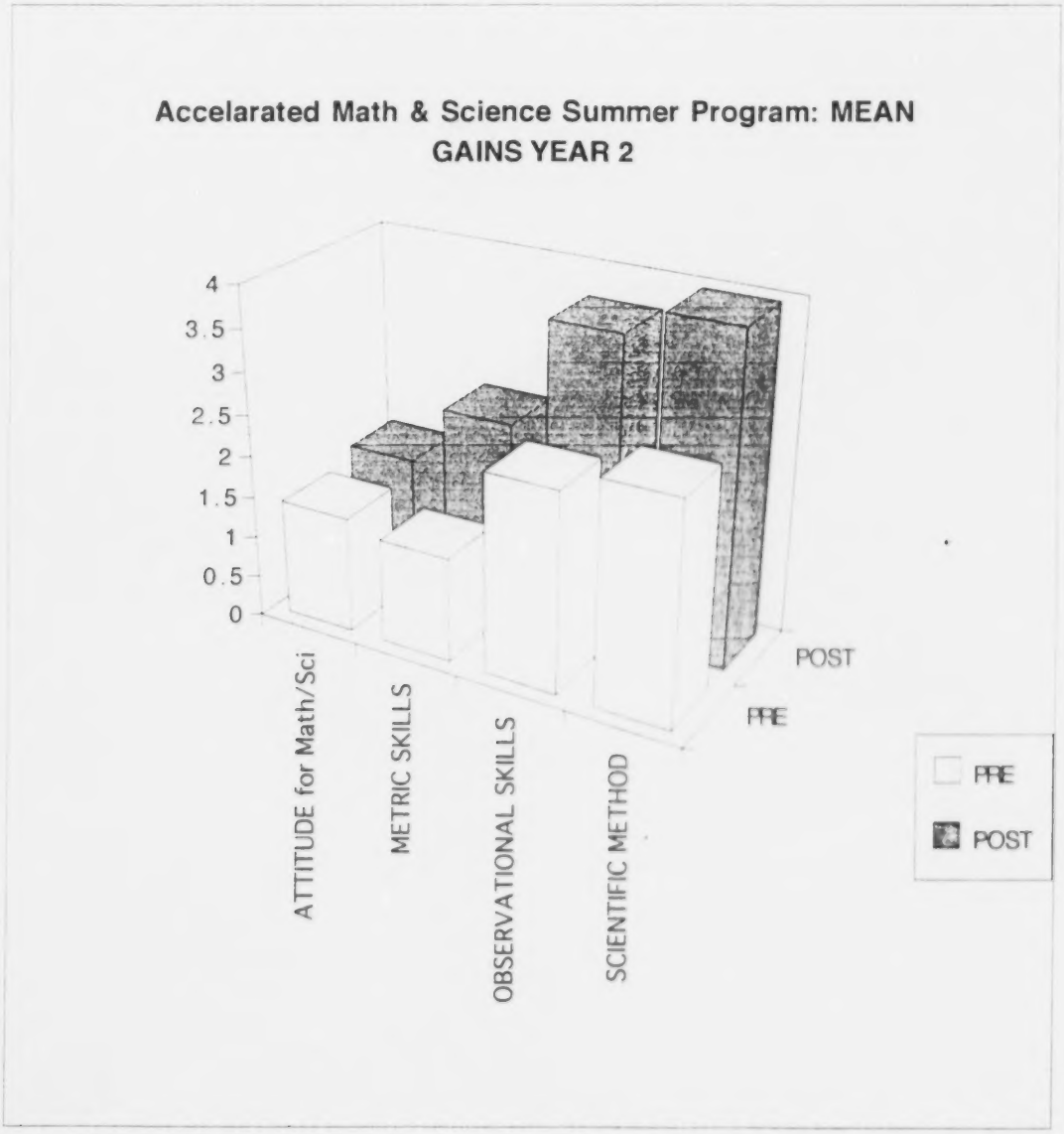
	FREQUENCY	%
PAUMA	19	20.2
BONSALL	20	21.4
ANAHEIM	13	13.8
VALLECITOS	14	14.8
VALLEY CENTER	9	9.6
VISTA Unified	19	20.2
N=	94	100



PRE AND POST TEST SCORES

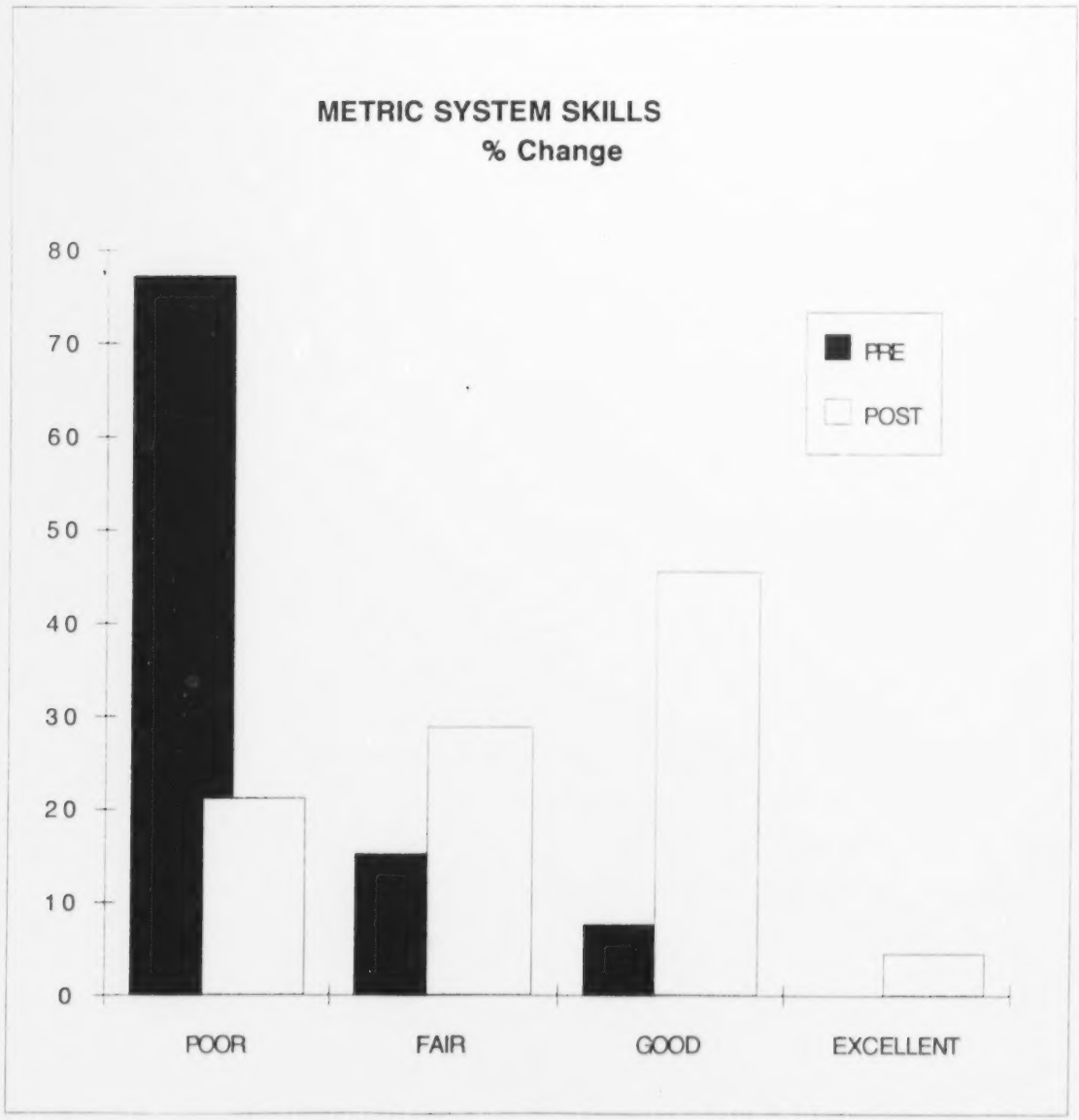
DOMAIN	PRE	POST	GAIN	T-TEST	SIGNIFICANCE
ATTITUDE for Math/Sci	1.41	1.57	0.16	-2.25	0.027**
METRIC SKILLS	1.27	2.32	1.05	-9.08	0.001*
OBSERVATIONAL SKILLS	2.41	3.64	1.23	-8.41	0.001*
SCIENTIFIC METHOD	2.66	3.96	1.31	-9.05	0.001*

* p<.01 ** p<.05



ACCELARATED MATH AND SCIENCE SUMMER PROGRAM

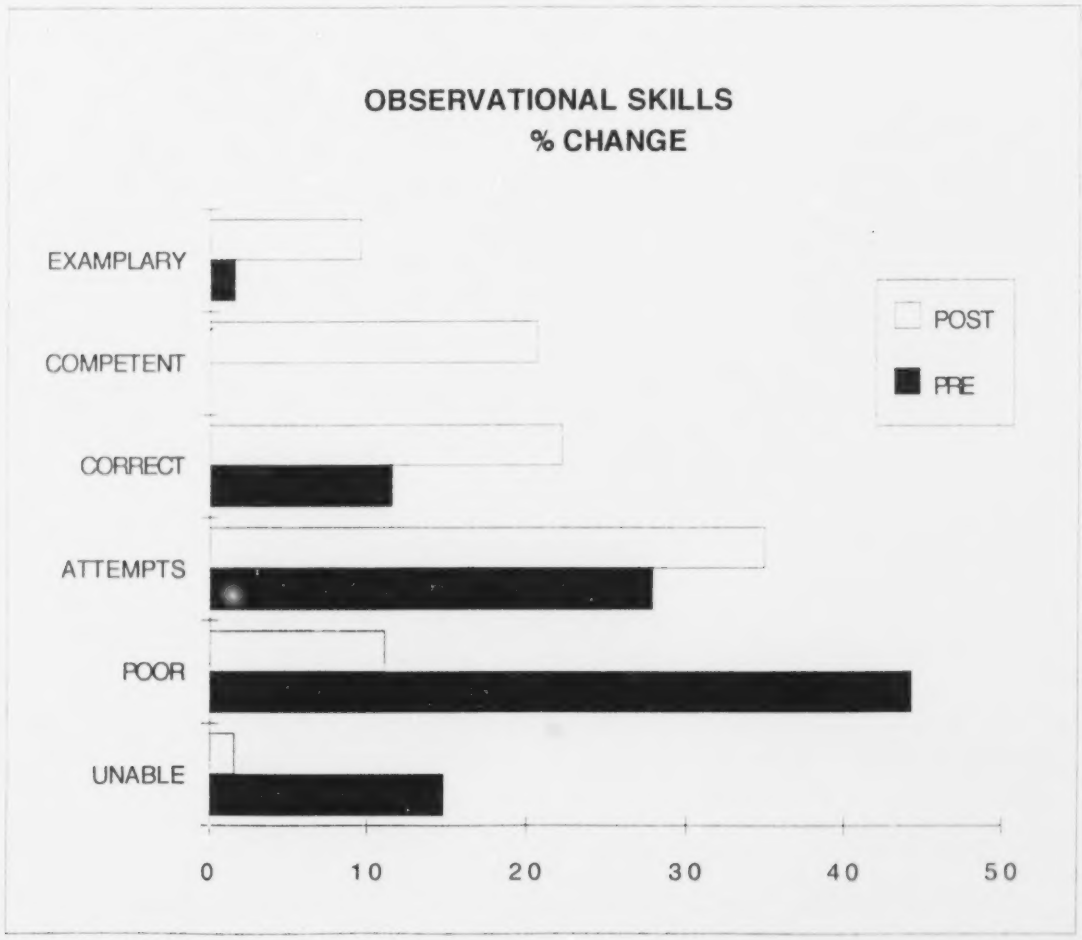
METRIC DOMAIN Criteria	% PRE	% POST	% Change
POOR	77.2	21.2	56.1
FAIR	15.2	28.8	13.6
GOOD	7.6	45.5	37.9
EXCELLENT	0	4.5	4.5
Valid Cases N=66	100	100	



PRE AND POST TEST SCORES

ACCELARATED MATH AND SCIENCE SUMMER PROGRAM

OBSERVATIONAL DOMAIN			
Criteria	% PRE	% POST	% CHANGE
UNABLE	14.8	1.6	13.2
POOR	44.3	11.1	33.2
ATTEMPTS	27.9	34.9	7.1
CORRECT	11.5	22.2	10.7
COMPETENT	0	20.6	19.1
EXAMPLARY	1.6	9.5	9.5
Valid Cases N=61	100	100	

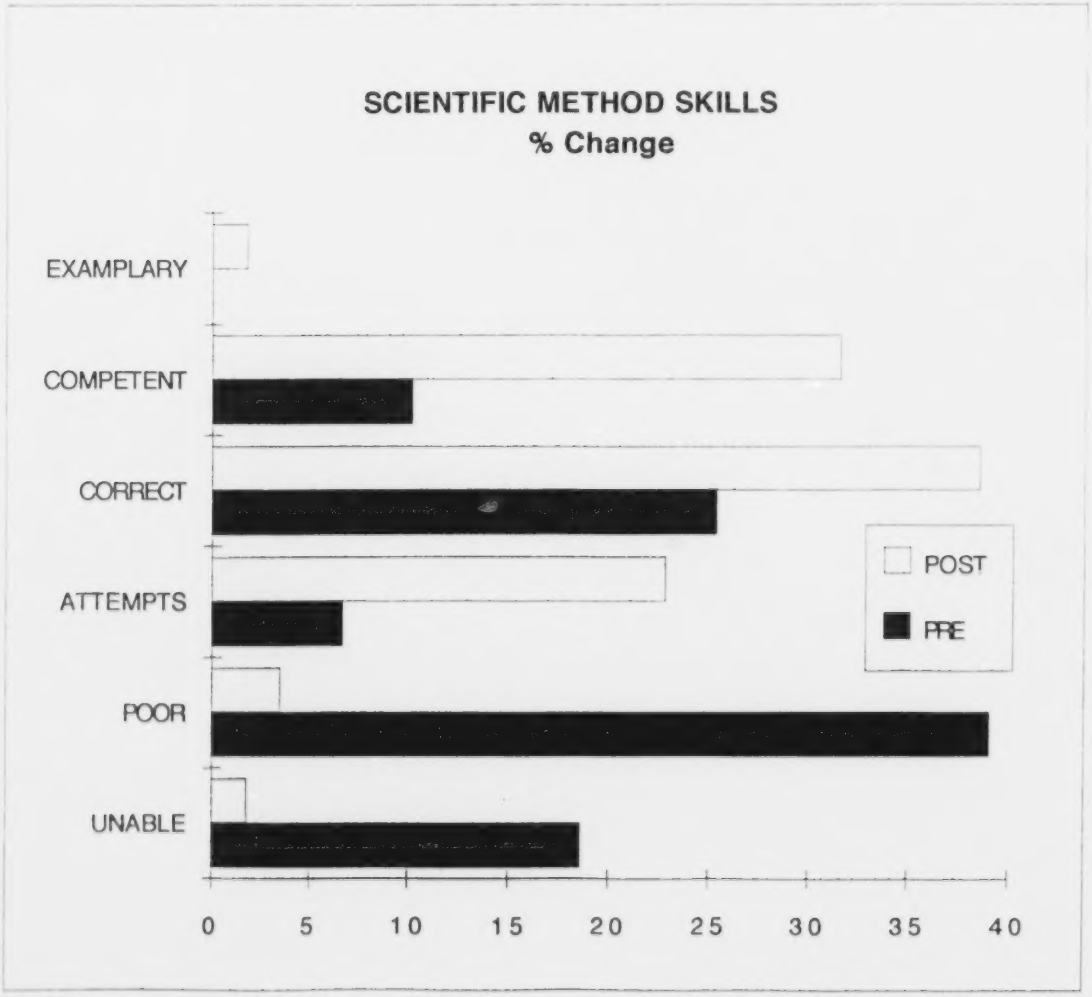


PRE AND POST TEST SCORES

ACCELARATED MATH AND SCIENCE SUMMER PROGRAM

SCIENCE METHOD DOMAIN

Criteria	% PRE	% POST	% CHANGE
UNABLE	18.6	1.8	16.8
POOR	39.1	3.5	35.6
ATTEMPTS	6.7	22.8	16.1
CORRECT	25.4	38.6	13.2
COMPETENT	10.2	31.6	21.4
EXAMPLARY	0	1.8	1.8
Valid cases N=59	100	100	

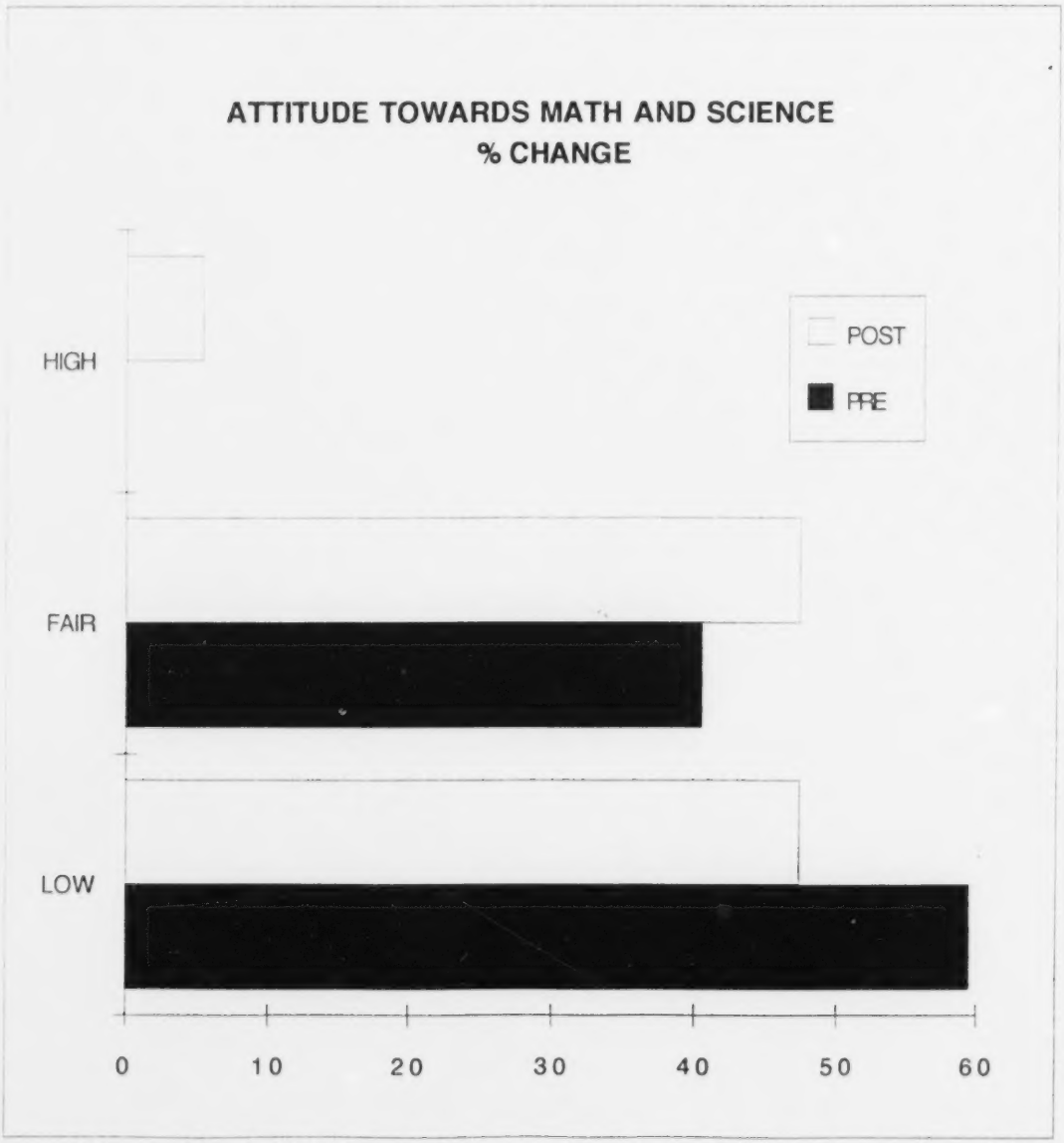


PRE AND POST TEST SCORES

ACCELARATED MATH AND SCIENCE SUMMER PROGRAM

ATTITUDE DOMAIN

Criteria	% PRE	% POST	% Change
LOW	59.5	47.3	12.3
FAIR	40.5	47.3	6.8
HIGH	0	5.4	12.2
Valid case N=74	100	100	



PRE AND POST TEST SCORES

Buman

June 27 - July 1, 1994

Grade or Class _____

Subject. Class or Section	2nd Hour	3rd Hour	4th Hour
① Pre test 2 part - including experiment w/egg 6-27 MONDAY	① Introduce notebook ② Introduce Scientific method - redoing egg/bottle experiment	① Observation exercise (description of partner) ② Introduce Science Learning Log	① Multiplication Game ② Daily Journal
Measuring/Weighing Description Activity 6-28 TUESDAY	① Sight + Sound Lab	① Weather Lab ② Air Mass Generator	① Science Learning Log ② ③ Daily Journal
① Liquid Measure 6-29 WEDNESDAY	① Sight + Sound Lab	① Weather Lab ② Air Mass Generator	① Science Learning Log ② ③ Daily Journal
① Microscope Use 6-30 THURSDAY	① Sight + Sound Lab	① Weather Lab ② Air Mass Generator	① Science Learning Log ② ③ Daily Journal
① ← OWL 7-1 FRIDAY	PELLETS → 20		① Science Learning Log ② Hundred Number Game ③ Daily Journal

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APPENDIX VIII

21 A

21

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RUTGERS UNIVERSITY LEADERSHIP PROGRAM IN DISCRETE MATHEMATICS

STUDENT MATHEMATICS SURVEY

1. What grade are you in? _____ Are you female _____ or male _____ ?

2. Which of the following describe your experience with math? (Check as many of the choices that apply to you.)

_____ Math is difficult for me	_____ I can't stand math
_____ Math comes easy to me	_____ I dislike math
_____ I find math challenging	_____ Math is OK
_____ I find math exciting	_____ I like math
_____ I find math boring	_____ I love math
_____ I believe that math is useful	_____ I find math irrelevant
_____ I find math interesting	_____ I don't know why math is so important
_____ I am successful in math	_____ I am unsuccessful in math
_____ I expect to use math in the future	_____ I don't expect to use math in the future
_____ I feel that I am good at math	_____ I feel that I am not good at math
_____ One of my most favorite subjects	_____ One of my least favorite subjects

_____ Fill in your own choice _____

_____ Fill in your own choice _____

3. What do you think math is all about? _____

4. What do you like about math? _____

5. What do you dislike about math? _____

6. Describe an experience that you have had with mathematics, if any, that was particularly memorable? _____

7. What math course (or courses) are you planning to take next year? _____
How has this year's math course influenced your decision, if at all? _____

8. What careers are you considering? _____

POW GRADING CRITERIA

COMPETENCY LEVEL:

EXEMPLARY - CORRECT ANSWER **SCORE 6**

Elegant explanation that is clear and unambiguous, strategy and reasoning clear and easy to understand, makes a strong argument.

COMPETENT - CORRECT ANSWER **SCORE 5**

Complete response with reasonably clear explanations, communicates effectively to the audience.

MINOR FLAWS - CORRECT ANSWER **SCORE 4**

Explanation unclear or incomplete, strategy used may be inappropriate or unclear, understands mathematical ideas involved.

BEGINS WELL - BUT REASONING FLAWED **SCORE 3**

Has attempted charts or diagrams with a logical but flawed strategy.

BEGINS BUT NOT COMPLETED **SCORE 2**

Some organized thinking, but uses an inappropriate strategy, reasoning very poor.

UNABLE TO BEGIN **SCORE 1**

Shows no understanding of the problem.

NO ATTEMPT **SCORE 0**

Blank paper or no attempt.